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ON THE TOPOGRAPHICAL ANATOMY OF THE ABDOMINAL VISCERA IN MAN, ESPECIALLY THE GASTRO-INTESTINAL CANAL. PART IV. By CHRISTOPHER ADDISON, M.D., B.S. (Lond.), F.R.C.S., *Professor of Anatomy, University College, Sheffield.* (PLATES XXXII., XXXIII., and XXXIV., and two Tables.)

(Continued from page 204.)

TABLE VII.

*Average Positions of the Parts in the Ileo-colic Region and of the Large Intestine.*

	Distance (centimetres).
The lower border of the ileo-colic junction as to C.D., . . . . .	2·3 below.
The lower border of the ileo-colic junction as to A.S.S., . . . . .	2·6 above.
The lower border of the ileo-colic junction as to Mid. line, . . . . .	5·9
The root of the appendix as to C.D., . . . . .	3 below.
"    "    "    umbilicus, . . . . .	5·7 "
"    "    "    A.S.S., . . . . .	2 above.
"    "    "    Mid. line, . . . . .	6
The lowest point of the cæcum as to A.S.S., . . . . .	1·23 below.
"    "    "    Mid. line, . . . . .	6·1
Innermost point "    "    "    A.S.S., . . . . .	2·1 above.
"    "    "    Mid. line, . . . . .	3·4
Inner border of large intestine at the right, in C.D., as to Mid. line, . . . . .	5·5
Outer border of large intestine at the right, in C.D., as to Mid. line, . . . . .	11·3
Highest point of the hepatic flexure colon as to E.F., . . . . .	2·5 below.
"    "    "    "    "    from the Mid. line, . . . . .	9

	Distance (centimetres).
Lowest point of the hepatic loop of the transverse colon as to E.F., . . . . .	9·8 below.
Lowest point of the hepatic loop of the transverse colon from the Mid. line, . . . . .	6·5
The upper border of the transverse colon in the Rt.L.L. as to E.F., . . . . .	2·25 below.
The upper border of the transverse colon in the Mid. line as to E.F., . . . . .	3·2 „
The upper border of the transverse colon in the Lt.L.L. as to E.F., . . . . .	1·3 „
The highest point of the splenic loop of transverse colon as to E.F., . . . . .	2·9 above.
The highest point of the splenic loop of transverse colon as to Mid. line, . . . . .	10
The outer border of colon at the left in E.F. (when at that level) as to Mid. line, . . . . .	10·6
The outer border of colon in C.D. (sigmoid) as to Mid. line, . . . . .	9·5
<sup>1</sup> The lowest point of the sigmoid flexure as to A.S.S., . . . . .	2·4 below.
„ „ „ „ C.D., . . . . .	7·4 „
„ „ „ „ Mid. line, . . . . .	5·6 „
Commencement of rectum as to C.D., . . . . .	5·7 „

THE LARGE INTESTINE. (See Plates XXXII., XXXIII., and XXXIV.)

*The Vermiform Appendix.*—The average position of the root of the appendix was in the right lateral line at a distance of 3 cm. below C.D. (or 2 cm. above the level of the anterior superior iliac spines). It is one inch directly below the point where a line drawn from the anterior superior iliac spine to the umbilicus crosses the right lateral line.

*Alterations in level.*—There were four cases in which the root of the appendix was displaced upwards above the plane of C.D. In cases 12 and 23 it was carried up by a distended cæcum, which would have been obvious on palpation. In the other cases, Nos. 17 and 18, there was a high cæcum, associated in case 18 with an ascending meso-colon, and having in case 17 very loose peritoneal attachments. In two of these cases and in five others (Nos. 8, 19, 27, 33, and 38) the *tail* of the appendix passed up above the *level* of C.D. In cases 19,

<sup>1</sup> This measurement refers to the sigmoid flexure as it passes over the brim of the pelvis.

33, and 27 the appendix was directed upwards into a retro-colic pouch; in the other cases it passed upwards outside an ascending meso-colon. In case 38 the appendix was unusually large, and reached outside the ascending colon to the under surface of the liver.

In seven cases the root of the appendix was more than 5 cm. below C.D., and was associated in all cases with a distended cæcum. In four of these cases (Nos. 7, 20, 22, and 30) the cæcum was prolapsed into the pelvic cavity.

In four cases the root of the appendix was less than 4 cm. from the middle line, being associated in cases 7, 22, and 30 with the prolapsed cæca.

In six cases it was more than 8 cm. from the middle line. The chief feature in these cases was distension of the cæcum.

The alterations in the position of the appendix as a whole, whether very high up or very low down, seem, therefore, specially associated with a distended condition of the cæcum, and the appendix is most likely to be found directed upwards when the peritoneal attachments of the cæcum are loose.

The position of the appendix *in relation to the cæcum* is chiefly regulated by the degree of absorption of its mesentery by the cæcum or colon, and by the state of distension of the cæcum; and this latter may move the appendix up or down. The tenseness of the peritoneum in the iliac fossa no doubt chiefly determines the degree of possible prolapse of the cæcum.

By some writers manifold classifications of the position of the appendix are adopted. If we are, however, guided by the state of its mesentery, the following divisions are natural enough.

The appendix generally hangs either partly or wholly over the margin of the psoas into the pelvic cavity. The direction of its free end is evidently a matter of small importance, as it will vary from time to time. Because of their clinical importance, those cases in which the root and body of the appendix lie wholly within the pelvic cavity should be given separately.

There are also the cases of an appendix wholly in the iliac

fossa, where it may either be free,—often in a retro-colic pouch,—or partly or wholly behind the peritoneum, these last cases being clinically very important. Finally, there are irregular cases made up chiefly of those in which the appendix is situated outside an ascending colon.

In this series there were—

1. Wholly in the pelvic cavity, 6 cases, or 15 per cent.
2. Free, hanging more or less over the pelvic brim, 16 cases, or 40 per cent.
3. Wholly in the iliac fossa, 14 cases, or 35 per cent.

Of these,

- a. 7 were quite free, being 17·5 per cent. of the whole series.
- b. 4 were partly free, and recurved into a retro-colic pouch, being 10 per cent. of the whole series.
- c. 3 were behind the peritoneum (Nos. 14, 15, 34), or 7·5 per cent. of the whole series.

4. Irregular cases, 4, or 10 per cent.

In three of the irregular cases the appendix was situated outside an ascending meso-colon, and in one case (No. 39), it was bound to the back of the cæcum.

The last case exemplified well the condition of an appendix adherent to the cæcum, without an apparent mesentery (see fig. 11, Pl. XXII., Pt. III.). One of the three cases in group 3 c was the seat of a small appendicular abscess (No. 34).

It is not necessary, after what has been said in Part III., to discuss further the various positions of the appendix.

*The Cæcum.*—The lowest point of the cæcum was situated, as a rule, 6·1 cm. from the middle line, and 1·23 cm. below the level of the anterior superior iliac spine; in other words, in the left lateral line, about  $\frac{1}{2}$  an inch below the level of the anterior superior iliac spine. In 20 cases, or 50 per cent., the variation was from the level of the spine to not more than 3 cm. below. The innermost point reached 3·4 cm. from the middle line, at a height of 2·1 cm. above the anterior superior iliac spine. The inner border of the large intestine at the right, in the plane of C.D., was 5·5 cm. from the middle line, and the outer border 11·3 cm.

*Low positions of the Cæcum.*—There were 7 cases in which the cæcum was prolapsed within the pelvis, and 3 other cases in which it was partly so; making 25 per cent. of the cases in which the cæcum was more or less completely in the pelvic cavity.

In case 6 there was a cæcum 8 cm. long, the lowest 6 cm. of which hung into the pelvic cavity. Cases 7, 8, 20, 22, 26, 30, and 36 presented instances of complete, and cases 6, 35, and 38, of partial, prolapse. These cases include amongst them all those in which the lowest point of the cæcum was more than 3 cm. below the level of the anterior superior iliac spine. In conjunction with these cases should be mentioned those of low level of the lower border of the ileo-colic junction, which had an average position of 2.3 cm. below C.D. There were 10 cases in which it was 4 cm. or more below C.D. Five of them, Nos. 7, 20, 22, 30, and 36, were cases of prolapse of the cæcum. In three others (Nos. 11, 21, and 40) the cæcum very much distended, and in the remaining two cases, Nos. 28 and 29, it was distended.

The chief characteristic of these cases of prolapse of the cæcum seems to be a distended, and in most cases a generally convoluted condition of the large intestine. Given distension of the cæcum, the tension of its various peritoneal attachments would seem to determine, in the main, the subsequent position, excepting in such a case as No. 36, in which the pressure of the liver must have prevented the distended cæcum from passing upwards.

*High positions.*—There were 6 cases (Nos. 12, 17, 18, 23, 31, and 37) in which the cæcum was displaced more or less completely above the level of C.D., and the common feature in nearly all of them was great distension of the cæcum. These cases include those in which the ileo-colic junction occupied its highest position.

It will be seen, on reference to the tables, that the chief lateral displacements of the ileo-colic junction and the innermost point of the cæcum were likewise associated with bowel distension.

The averages given in the tables, and the outline in fig. 3, Part I., would appear, in the absence of obvious distension, to be a fair representation of a non-prolapsed cæcum.

If the outlines on the plates be studied, it will be seen that, in many of the cases of distension of the cæcum, especially when it

was not prolapsed, it presented a twist-like appearance, as if the lower part had passed upwards and inwards in front of the ileo-colic junction (case 23). The condition appeared to be produced by the peritoneum having firmer attachments to the front of the colon, just above the ileo-colic junction, fixing this part of the bowel more or less, and allowing the anterior and lower parts to move upwards. In some of these cases the lowest part of the large bowel was not cæcum.

The shapes of the cæca in these cases do not conform very well to any system of varieties of type. It would seem that the third and fourth types of Treves (15) are chiefly, and about equally represented, and the second type in 5 cases.

*The Ascending Colon.*—The distance of the outer border of the ascending colon, from the middle line in the plane of C.D., did not present much variation. It had an average of 11·3 cm., and 34 cases, or 85 per cent., varied between 10 and 12·5 cm.

The spot along the outer border of the ascending colon, where it definitely bends forward as the hepatic flexure, averaged 9 cm. from the middle line; 35 cases being between 8 and 10·5 cm. The variations in level of this point will be considered with the transverse colon. Two points deserve notice.

In many cases the ascending colon, about the level of the iliac crest, had a well-defined kink in it, brought about by its being in these cases very strongly bound down to the back abdominal wall by its peritoneal attachments. In some cases, as in No. 40, these were sufficiently strong to effectually bar the distension of this part of the bowel, although the neighbouring parts were very much distended. (See also cases 13, 16, 15, 17, 39, 10, 11, and 12).

At the beginning of this work, on account of the well-marked facet produced on the lower part of the right kidney by the colon in hardened specimens, the colon was looked upon as contributing in a considerable degree to the support for the kidney. But it is clear, although the ascending colon often presses well on the lower part of the right kidney, that the kidney is often as high or higher than usual when it is quite devoid of support from the colon below. Cases 24, 36, 15, and 7 very clearly show this point.

*The Transverse Colon.*—The point already spoken of as that

where the ascending colon passes into the hepatic flexure is described in the tables as the *highest point* of the hepatic flexure of the colon. As a matter of fact, the bowel mostly bulges a little higher on an anterior plane before forming a downward loop, but as this point is the most stable part of the flexure, it is the most serviceable for purposes of measurement.

*Shape.*—There appear to be two chief varieties in the shape of the transverse colon, determined by the presence or absence of a loop downwards from the hepatic flexure.

1. The loop would appear to represent a permanence or exaggeration of the primitive bend of the colon at this place.

The commonest variety of transverse colon is that which presents a downward hepatic loop, of which cases 19, 20, 21, 25, and 26 may be taken as examples. In these cases the transverse colon at its commencement bends more or less directly downwards for a variable distance in front of and to the inner side of the ascending colon, and then passes upwards again nearer to the middle line to about the level of its hepatic flexure, and thereby completes a loop downwards. It then passes more or less obliquely upwards across the abdomen to the left side along the lower border of the greater curvature of the stomach.

At the left side, under cover of the ribs, it usually forms a loop for a variable distance upwards on an antero-posterior plane, the posterior or distal limb of the loop passing downwards until it reaches the basal surface of the spleen, across which it is directed backwards to the posterior abdominal wall, where it turns abruptly downwards as the descending colon.

The hepatic loop downwards of the transverse colon is often very firmly fixed and difficult to undo, and the peritoneum attached to the lower part of the downgoing limb of the loop is frequently shortened, and there are commonly adhesions between this downgoing limb and the adjacent ascending colon. Perhaps the tendency to form adhesions at this place is favoured by the bowel contents having better opportunity in this somewhat stable and more or less abrupt bend to set up a certain amount of irritation. This hepatic loop downwards of the transverse colon was present in 22 cases or 55 per cent.

2. In several cases, as in case 11, there was no loop down-

wards on that transverse colon at the under surface of the liver, but it passed directly across the abdomen, or bulged forwards for a variable distance covering up the termination of the ascending colon and then passed directly across the abdomen to the left (see case 12).

This straight variety was fairly well represented in 9 cases, or 22·5 per cent, of which cases 11, 12, 13, 14, and 40 are the best examples.

*Splenic Flexure.*—The loop upwards of the transverse colon in front of the spleen was directed, as a rule, from before backwards more or less directly, and, as a rule, the anterior limb of the loop was the more internal. Cases 8, 10, 12, 15, 19, 23, 30, 31, 37, and 39 present good examples of this condition. In some cases the direction of the splenic loop upwards was transversely on a coronal plane, of which case 6 is a good example, and cases 1, 9, 22, 35, and 40 illustrate it in varying degrees. In case 3 the loop was directed forwards on a horizontal plane.

Generally speaking, 24 cases, or 60 per cent., presented a well-defined splenic loop having a sagittal direction, and 7 cases, or 17·5 per cent., possessed a loop with a coronal direction.

At some part, usually at the termination of the splenic flexure, the colon often presented a diminution in its lumen with marked sacculaton, of which cases 6, 13, 14, 17, 20, and 35 are examples.

The colon is firmly fixed at the posterior part of the basal surface of the spleen, and is sometimes capable of resisting considerable distension of the bowel, as in cases 6 and 35.

The *highest point* of the hepatic flexure averaged 2·5 cm. below the level of E.F. The hepatic loop passed downwards, in the average of those cases in which it was present, to 9·8 cm. below E.F., and the mid-point of the extremity of the loop was situated 6·5 cm. from the middle line—in other words, the extremity of the loop was situated about the level of the iliac crest in the right lateral line.

From the hepatic loop the colon passed upwards and to the left and crossed the middle line with its upper border 3·2 cm. below E.F., and its lower border 7·2 cm. below, or about 3 cm. above the umbilicus. In the left lateral line the upper border of the transverse colon averaged 1·3 cm. below E.F. The highest point

of the splenic loop upwards was 2.9 cm. above E.F. at a distance of 10 cm. from the middle line. The lowest point of the spleen averaged 2.5 cm. below E.F., and this in a general way may be said to mark the level of the commencement of the descending colon, so that the splenic loop upwards of the transverse colon passed 5.4 cm. higher than the lowest point of the spleen. If, however, the cases in which the splenic flexure of the colon was prolapsed be excluded, the average position of the highest point of the splenic loop would be rather more than 1 cm. higher.

*Variations.*—There were 24 cases, or 60 per cent., in which the highest point of the hepatic flexure of the colon ranged from the level of E.F. to 4 cm. below. There were 4 cases in which it was 2 cm. more above E.F., viz., cases 5, 25, 31, 37.

There were 9 cases in which it was more than 4 cm. below E.F., up to 8.5 cm. below in case 24. (These cases were chiefly associated with prolapse of the transverse colon, and will be considered with directly.)

There were 10 cases in which the upper border of the transverse colon in the middle line was situated above the level of E.F., four of them being not more than 2.5 cm. away. The other cases (Nos. 1, 8, 25, 31, 35, and 40) varied considerably up to 9 cm. above E.F. Those cases in which the transverse colon found room for itself in the upper part of the abdominal cavity in front of the stomach have already been considered—Part II. They were cases 1, 6, 8, 12, 25, 31, 35, 37, and 40.

*Prolapse of the Transverse Colon.*—There were 14 cases in which the upper border of the transverse colon was more than .5 cm. below E.F. in the middle line, seven of them ranging from 10 to 15.25 cm. below; viz., cases 2, 7, 15, 30, 32, 36, and 38.

The upper border of the transverse colon in the middle line ranged from 9 cm. at one E.F. to 15.25 cm. below, so that it must be considered a very variable point, and the average cannot be taken for much. There were, however, 20 cases, or 50 p.c., in which the line E.F. would have hit off sufficiently same part of the lumen of the transverse colon in the middle line.

There were 6 cases in which the transverse colon passed across the abdomen wholly below the umbilicus; viz., cases 2, 7, 15, 30, 32, and 36. In 5 others the umbilicus was situated nearer the upper than the lower border of the bowel. So that

in more than a quarter of the cases the transverse colon passed below, or in greater part below, the umbilicus in the middle line.

In considering the question of prolapse of the transverse colon, it is necessary to observe what the accompanying position of the transverse meso-colon is. Five of the cases of a low position of the transverse colon had the attachment of the transverse meso-colon as high or even higher than usual. In them, therefore, the low position of the bowel was associated with an elongated, not a prolapsed mesentery.

The average level of the attachment of the transverse meso-colon in the middle line was 3 cm. below E.F., and at its commencement on the right side, 6.45 cm. below E.F. Sometimes its attachment at the right may be low down, while that in the middle line is as high as usual, but the low attachment at the right may be sufficient to allow of prolapse of a great part of the transverse colon.

We may, however, with sufficient accuracy define prolapse of the transverse colon or of its mesentery, as when the upper border of the bowel or the attachment of its mesentery in the middle line is more than 5 cm. below E.F. There were thus 14 cases of prolapse of the transverse colon more or less considerable, and 8 cases of prolapse of the transverse meso-colon more or less considerable. Seven cases (Nos. 2, 15, 22, 24, 27, 36, and 39) were common to the two groups. In case 7 also the meso-colon at its commencement was as low as the level of the iliac crest, and was of considerable length. In case 24 the meso-colon did not start until within 3 cm. of the middle line, and was situated below the level of the iliac crest. In case 30 there was a very long meso-colon attached 5 cm. below E.F. in the middle line, and a little lower than usual at the right, and in this case the transverse colon ran across below the level of C.D.

If the diagrams of the cases presenting both prolapse of the transverse colon and of its mesentery be compared with the similar outlines of the liver (Plate LII., Part II.) and stomach (Plates XLIII. and XLIV., Part I.), it will be seen that a low position of the liver was especially remarkable, and in many cases also the stomach was low down in the middle line. More than this can hardly be said.

*The Descending Colon.*—There is not much to be added to the current descriptions of the descending colon. The upper portion of the descending colon, together with the lowest part of the splenic flexure, is, as a rule, the least distended part of the large intestine, and presents many sacculations and is firmly fixed.

The descending colon, passing downwards along the outer border of the lower segment of the left kidney, presents in many cases a well-marked bend inwards immediately below the lower pole of the kidney. This bend is seen in varying degrees in cases 7, 8, 26, 14, 6, 15, 16, 18, 19, 27, 33, and 34. The displacement of the bend downwards in the case of a low position of the left kidney is well shown in case 14.

The descending colon in three cases (Nos. 9, 13, and 18) passed downwards into a pocket beneath the outer border of the psoas muscle, and was firmly fixed there by the peritoneum, and required to take a sharp curve upwards and outwards around the outer border of the muscle before passing downwards as the sigmoid flexure.

*Surface Marking.*—The descending colon commences, as a rule, 2.5 cm. below E.F., with its outer border 10.6 cm. from the middle line. It continues downwards at this distance from the middle line to about half-way between E.F. and C.D. (to 6.2 cm. below E.F.), where, opposite the lower pole of the left kidney, it presents the bend inwards of nearly 2 cm., and the inner border of the bowel almost reaches the lateral line. At the level of the iliac crest it again bends outwards until its outer border in the plane of C.D. is 9.5 cm. from the middle line, and at 1.1 cm. below C.D. it begins to be attached over the psoas muscle and passes into the sigmoid flexure.

*Sigmoid Flexure.*—The sigmoid flexure usually continues downwards more or less firmly bound to the psoas, in a curve with its convexity outwards, passing about 3 cm. interval to the anterior superior iliac spine, until it reaches the brim of the pelvis about the level of the anterior superior iliac spine, where it becomes possessed of a well-marked mesentery of variable length, and acquires a considerable degree of mobility. The lower border of the sigmoid flexure as it passes over the pelvic brim is situated in the average 2.4 cm. below the anterior superior iliac spine 5.6 cm. from the middle line; but for practical purposes a

*point in the left lateral line at the level of the anterior superior iliac spine may be taken to correspond to some part of the lumen of the sigmoid flexure at the place where it becomes freely movable.*

Treves' (15) description of an omega-shaped loop of the sigmoid flexure within the pelvis represented the majority of the cases. There were, however, 8 cases, or 20 per cent., in which a large loop of the sigmoid flexure extended out of the pelvis into the umbilical or the right or left iliac regions, viz., cases 9, 11, 14, 23, 25, 31, 40. In these cases the loop was usually simple and very distended.

A study of the rectum, except the point of its commencement, has not entered into this work.

#### SUMMARY.

To summarise in general terms the position in regard to the surface of the chief points of the large intestines:—

The lower border of the ileo-colic junction is situated in the right lateral line, half-way between the planes of the anterior superior iliac spines and C.D.

The root of the appendix is immediately below this, or in the right lateral line, one inch below a line drawn from the anterior superior iliac spine to the umbilicus.

The innermost point of the cæcum is about the level of the anterior superior iliac spine, midway between the middle line and the right lateral line.

The lowest point of the cæcum is in the right lateral line about  $\frac{3}{4}$  of an inch below the anterior superior iliac spine.

The outer border of the ascending colon is a little internal to a line drawn vertically upwards from the right anterior superior iliac spine.

The hepatic flexure of the colon rises to a little below E.F., a little internal to the line just described.

The lowest point of the hepatic loop downwards of the transverse colon is at the level of the highest part of the iliac crest in the right lateral line.

The upper border of the transverse colon in the middle line is about 1 inch below E.F., or nearly three inches above the umbilicus, but it is subject to considerable variation.

The *upper border of the transverse colon* in the left lateral line is at the level of E.F.

The *upper border of the splenic flexure of the colon* is a little internal to a line drawn vertically upwards from the left anterior superior iliac spine about an inch and a half above E.F.

The *descending colon* commences an inch below E.F., a little further outwards than the preceding. Half-way between E.F. and C.D., at the lower pole of the left kidney, its inner border nearly reaches the left lateral line. In the plane of C.D. its outer border is situated nearly as far outwards as its commencement, and little below C.D.—half an inch—it becomes the sigmoid flexure.

The *sigmoid flexure* becomes possessed of a free mesenteric attachment in the left lateral line in the plane of the anterior superior iliac spine.

The *rectum* commences a little to the left of the middle line, at the level of the anterior superior iliac spine.

<sup>2</sup> The *outer point* is the spot on the outer border of the kidney nearest to the plane of E.F. at which the kidney reaches its extreme right or left, as the case may be.

## THE LIVER (fig. 3, Part I., and Plate LII., Part II.).

So much has been said concerning the liver and the other solid viscera in the upper part of the abdomen in various parts of the paper, that little remains except to indicate their general position and to summarise their chief changes of position.

In considering the changes in position of these viscera it is better to take the upper border as an index of displacement, for, as is especially seen in the case of the liver, enlargement of the organ generally affects the position of the lower border more than the upper.

In these cases there was an unusually large number of instances in which the liver was either displaced downwards from intrathoracic causes, or in which its lower border occupied a low position from enlargement of the organ; so that the average obtained of the position of the lower border of the liver, and depicted in fig. 3, Part I., is in all probability nearly 1 cm. lower than it is in the average healthy body.

Also it must be remembered that the liver, of all the solid viscera in the abdomen, even including the spleen, is the most subject to changes in position in respiration and in the different positions of the body. The anterior parts of the liver especially are subject to a considerable range of movement from above downwards and from right to left.

There is this great advantage in connection with the liver—which, as we have seen, is so important an agent in determining the position of other abdominal organs—that it can in most cases be percussed out in the living subject.

*Average Position.*—The movable *left extremity* is situated in the average about equal distances—nearly 3 inches—both above E.F. and from the middle line in the region of the sixth left costo-chondral junction; being precisely 7·1 cm. from the middle line and 7·4 cm. above E.F.

The *upper border* in the middle line is situated nearly 1 cm. below the infra-sternal notch, or 9 cm. above E.F. In the right lateral line it is situated rather less than 1 cm. above the infra-sternal notch (·6 above), being 10·4 cm. above E.F.

The upper border of the liver is in the right lateral line at

the lower part of the 5th intercostal space, and in the left lateral line at the same level is the summit of the stomach.

The *right border* of the liver practically attains its extreme distance (11.4 cm.) from the middle line in the plane of E.F., being at little interval to a line drawn vertically upwards from the right anterior superior iliac spine. From the plane of E.F. this border continues downwards for 3 inches to about the level of the umbilicus, being situated far back in the abdomen. Its precise position is 7.4 cm. below E.F., and it projects about 2 cm. below the right costal margin.

The *lower border* in the middle line passes just above the plane of E.F. (.2 cm.). In the right lateral line about an inch below E.F., it usually presents a notch from which the gall-bladder projects. The lower border of the liver in this line is 2.4 cm. below E.F.; the tip of the gall-bladder being 3.7 cm. below E.F. On reference to fig. 3, Part I., it will be seen that the intersection of the right lateral line and E.F. represents the outer border of the duodenum as it overlaps the right kidney and the place where the neck of the gall-bladder is in contact with the duodenum. Continued to the right beyond the right lateral line, the lower border of the liver passes nearly horizontally until near the costal margin, along which it turns downwards to reach its lowest point.

*Relations.*—The extent to which the liver overlaps the stomach and the duodenum and its relation to those parts have been already fully set forth.

Fig. 3 shows that, in the average, the right costal margin, from a level midway between E.F. and the infra-sternal notch to a point 4 cm. outside the right lateral line, practically represents the lower boundary of the hepatic surfaces of the right supra-renal body and kidney.

The relative levels of the liver and the right kidney will be considered under the right kidney.

It was particularly noticed in a large number of cases (the number was not recorded) that the spigelian lobe of the liver extended from outside, beneath the inferior vena cava for a considerable distance, so as, in some cases, to make an almost complete tunnel in the liver for the vessel. The average distance of the outer border of the inferior vena cava from the

middle line at this place was 3·6 cm. (See Plate LII., Part II.)

*Variations.*—The upper border of the liver in the right lateral line had an average position of 10·4 above E.F. There were 21 cases, or 52·5 per cent., in which the variation was from 9 to 12 cm. inclusive. There were 5 cases less than 8 cm. above E.F., viz., cases 2, 7, 11, 15, and 27. There were 7 cases more than 12·5 cm. above E.F., viz., cases 4, 5, 40, 9, 10, 31, and 23.

If we compare the position of the upper border of the liver in these cases to the infra-sternal notch, it will be seen that cases 15, 7, 2, and 27 were the lowest in regard to the notch. Further, if we compare throughout the whole series of cases the level of the upper border of the liver in the right lateral line, both with regard to E.F. and the infra-sternal notch, and also consider the upper border in the middle line with regard to the infra-sternal notch (although this level is much less important, as the part of the liver concerned is more movable), it will be found that the cases of lowest position of the upper border of the liver were Nos. 15, 7, 2, 27, 16, 30, 22, 32, and 11. In cases 15, 22, and 27 the liver was displaced downwards, from intra-thoracic causes. Finally, if we consider those cases in which the *lower border* of the liver in the right lateral line extended lowest down, we find that they are cases 15, 7, 22, 36, 2, 16, 24, 27, and 39. In the two groups of cases of the lowest positions of the upper and lower borders of the liver, we find that out of the 9 cases given in each, 6 cases are common to the two groups.

In a similar way, the livers occupying the highest positions are found to be in cases 4, 5, 34, 9, 10, 23, 40, 37, 12, 31, and 21. A large number of livers has been given in each group for the sake of comparison when the section on the right kidney is reached. Respecting the observation made of the unreliability of the upper border of the liver in the middle line being any indication of the general position of the upper border of the liver further to the right because of the great variableness of the part of the liver overlying the middle line both in size and mobility, reference should be made to outlines 9 and 14.

In many cases, such as Nos. 40, 4, 15, 16, 19, 22, 24, 34, and 39, the liver extended far over to the left across the stomach,

in case 34 actually insinuating itself between the diaphragm and the spleen. In 6 cases, or 15 per cent., the liver extended as little as, or less than, 4 cm. to the left of the middle line. In case 35 it barely crossed the middle line.

The lateral variation of the right border of the liver in E.F. was very small, 33 cases, or 82·5 per cent., being between 10 and 12·5 cm. The average was 11·4 cm.

*Gall-Bladder.*—The lateral variations of the gall-bladder from the right lateral line were not considerable. In 30 cases, or 75 per cent., the line passed through some part of the fundus of the gall-bladder or within 1 cm. of its margin. In 8 of the cases, Nos. 9, 17, 20, 22, 25, 27, 33, and 34, the lower extremity of the gall-bladder was overlapped by liver substance to a varying extent.

In 3 cases, Nos. 15, 22, and 24, the gall-bladder extended on to or within 1 cm. of the middle line. In all three instances the liver extended very low down towards the middle line, and would have been easily mapped out by superficial examination.

### THE RIGHT KIDNEY.

(Plates XXIII. and XXIV., Part III., and fig. 3, Part I.)—*Average Position.*—The *upper pole* of the right kidney in the average is situated a little interval to the right lateral line 3·4 cm. above E.F.; the innermost point of its upper segment is 3·9 cm. from the middle line, 1 cm. above E.F.; the mid-point of the hilus is 5 cm. interval to the lateral line 2 cm. below E.F.; and the innermost point of its lower segment is rather more than half a centimetre further from the middle line than the corresponding point of the upper segment.

The *lower pole* is a little external to the right lateral line 7 cm. below E.F., that is, 2·5 cm. above the highest point of the iliac crest, or 3·3 cm. above the umbilicus. Passing from above downwards, the outer border reaches its extreme right of 9·8 cm. from the middle line at 2 cm. below E.F.

Speaking generally, the line E.F. passes transversely across the kidney at the junction of its upper third with its lower two-thirds, and the lateral line passes vertically at the junction of the internal third with the outer two-thirds. From the point of

intersection of E.F. and the right lateral line, in their average position at the costal arch, the right kidney extended vertically upwards for 3·4 cm. and transversely outwards for the same distance.

*Variations.*—In considering the variations in level of the right kidney, the upper pole may be compared both with E.F. and the first lumbar intervertebral disc.

*E.F.*—The upper pole varied between 2 cm. and 4·5 cm. inclusive above E.F. in 21 cases, or 52·5 per cent. In 8 cases it was lower than this, the lowest being case 20 in which it was on the plane of E.F. In 11 cases it was more than 4·5 cm. above E.F., the highest being 8 cm. in case 10.

*The Disc.*—The average position of the upper pole of the right kidney was 3·7 cm. above the first lumbar intervertebral disc. In 7 cases it was 1 cm. above the disc or lower than this, down to 1 cm. below in case 20. In 10 cases it was 5·5 cm. above the disc up to 9 cm. above in case 10.

The extreme variations in the level of the right kidney in regard to E.F. was therefore 8 cm. from the same level to 8 cm. above, and in regard to the first lumbar intervertebral disc 10 cm. from 1 cm. below to 9 cm. above.

The relative levels of the duodenum and the right kidney have been considered in Part III.

*The Liver.*—The average distance vertically upwards between the upper pole of the right kidney and the upper border of the liver in the right lateral line was 7 cm.

If we take this distance in the cases in which the liver was lowest down and in those in which it was highest up, we get—

<i>Liver Low.</i>		<i>Liver High.</i>	
Case.	Distance.	Case.	Distance.
No. 15,	2·5 cm.	No. 4,	7·25 cm.
„ 7,	3 „	„ 5,	7·5 „
„ 2,	4 „	„ 34,	5·5 „
„ 27,	5 „	„ 9,	11·5 „
„ 16,	3 „	„ 10,	5·5 „
„ 30,	6·5 „	„ 23,	10 „
„ 22,	7 „	„ 40,	9 „
„ 32,	7·5 „	„ 37,	8·25 „
„ 11,	6·25 „	„ 12,	8·5 „
Average, 4·97.		„ 31,	9 „
		Average, 8·2.	

The difference between these two averages indicates that when the liver is displaced upwards it leaves the right kidney to some extent. On the other hand, the figures show that when the liver is lower than usual it moves down, to some extent, on the surface of the right kidney. But from this latter conclusion it does not follow that the liver in its descent does not push the right kidney down in some measure. From its firm position and attachments, we should not expect that in any one case the kidney would move downwards *as much* as the more movable liver.

If the outlines on Plate LII., Part II., be consulted, it will be seen that, in the foregoing cases of low livers, the duodenum was, in all of them except Nos. 27, 32, and 11, almost wholly pushed off the right kidney. On the other hand, the cases of high position of the liver will be seen to be those pre-eminently in which the duodenum passed on to the kidney at or near its upper end.

That the liver in its growth or displacements downwards increases the hepatic surface of the right kidney and pushes the duodenum off the kidney seems quite clear.

Consider, further, case 16. The upper pole of the kidney in this case was 2.6 cm. higher than the average, both above E.F. and the first lumbar intervertebral disc, and nearly the whole of its anterior aspect was in contact with the large liver, which, with its upper border considerably lower than usual, had extended far down into the abdominal cavity. It cannot be considered that in this case the liver had displaced the kidney downwards at all.

If, however, we consider side by side those cases in which the right kidney was lowest down as regards both E.F. and the intervertebral disc, we find that they include a considerable number of cases in which the liver also was low down.

We should, of course, expect a certain correspondence between the levels of the various viscera in any one case, in the absence of exceptional displacing forces.

In the case of those instances in which the kidney was highest up, we find, again, a considerable number of those having high positions of the liver.

It would seem, therefore, that whilst the general levels of the

viscera vary in particular cases, and in which the liver and right kidney share, the liver is unable to materially displace the right kidney downwards.

*The Colon.*—The hepatic flexure of the colon must be considered amongst the forces which may assist in maintaining the right kidney in its position, for in most cases it presses considerably on the lower segment of the right kidney.

Except in the cases of prolapse, the colon passes upwards on the anterior aspect of the lower segment of the kidney, and in these there is not much to be learnt from the figures as to the amount of support it gave to the kidney. But in cases 7 and 15 it could have given the kidney very little support, and in cases 24 and 36 none at all, as, especially in the former, it had wholly retreated from the kidney; which, as it happens in both cases, was higher than usual.

*Band.*—In case 24 the connective tissue passing from the upper pole of the kidney to the diaphragm was carefully dissected; it contained a very strong fibrous band passing on to the right crus as it passed forward. This band very clearly gave additional strength to the connective tissue helping to keep the kidney in its place. A similar condition was remarked in several other cases, but in none was it so well marked as in case 24, in which, as we have seen, the kidney had lost its colic support, and in which, moreover, the liver had descended very low down.

This case, perhaps, most forcibly of all, shows that, in the absence of lax connective tissue, the kidney is very much independent of the pressure of the liver above, or of the support from the colon below.

*Other Points.*—The kidney in case 38, and less so in case 11, was spoken of as movable, but the cases present no special feature.

The highest point of the right supra-renal body averages 5.3 cm. above E.F., about half-way between the middle and lateral lines. The lowest point is .2 above E.F. The innermost point is situated 2.5 cm. from the middle line, and is overlapped by the inferior vena cava for 1.1 cm.

### THE PANCREAS.

The alterations in level of the pancreas, the relative size of its surfaces, the position or absence of its omental tuberosity, and the shape and changes in position of its head, have been dealt with under the stomach and the duodenum.

As the pancreas passes to the left across the face of the left kidney, it frequently presents a slight twist, bringing its inferior surface to look downwards and a little to the right.

The upper border in the middle line averages 2·4 cm. above E.F., its anterior (or lower) border being 1·5 cm. below. The vertical depth of the body of the pancreas in the middle line was therefore 3·9 cm. The head extends to the right in the bend of the duodenum to within ·5 cm. of the right lateral line.

In the left lateral line its anterior border is ·3 cm. above E.F., and its upper border 3·4 cm.; the gastric surface measuring 3·1 cm. vertically. Maintaining the same level for a further 3 cm. outwards, the tail terminates behind the hilus of the spleen, abutting on the basal surface, at a distance of 9·13 cm. from the middle line.

The constancy of E.F. with relation to the head of the pancreas has already been pointed out.

In 5 cases the anterior border in the left lateral line was on the same level as E.F.; in 23 other cases it was not more than 2 cm. away from that line, either upwards or downwards; so that in 28, or 70 per cent., of the cases it was not more than 2 cm. from E.F. one way or the other. There were 7 cases in which it was more than 2 cm. above than E.F., the highest being 4 cm. in cases 6 and 31.

There were 5 cases more than 2 cm. below E.F. up to 6 cm. below in case 2.

### THE SPLEEN.

The anterior border of the spleen terminates 1·4 cm. below the plane of E.F., a little internal to a line drawn upwards from the left anterior superior iliac spine. The lowest point of the spleen, usually at the posterior aspect of the basal surface, is

situated 2.5 cm. below E.F. The anterior border of the spleen passes, as a rule, nearly directly upwards at 11.5 cm. from the middle line for nearly 5 cm. above E.F.; it then bends inwards in the concavity of the diaphragm until just inside the lateral line, where it attains its highest point at 8.7 cm. above E.F., and 1.1 cm. below the infra-sternal notch. From this point the border turns inwards and downwards, until at a distance of 3.6 cm. from the middle line the spleen attains its innermost point, which is, as a rule, where the spleen overlaps the summit of the left supra-renal capsule, at a height of 5 cm. above E.F.

*Variations.*—The highest point of the spleen in relation to the infra-sternal notch is fairly constant.

In 30 cases, or 75 per cent., it varied from 1 cm. above the notch up to 2.5 cm. below it. There were 4 cases more than 1 cm., up to 2.5 cm. (in case 10), higher than the notch, and there were 6 cases in which it was more than 2.5 cm. below the notch, the lowest being 5.5 cm. in case 27.

There were 26 cases, or 65 per cent., in which the lowest point of the anterior border of the spleen varied from 2 cm. above E.F. to 3 cm. below. There were 10 cases more than 3 cm. below E.F., the lowest being 7.5 cm. in case 2. There were 4 cases in which this point was more than 2 cm. higher than E.F., the extreme being 4.5 cm. in case 37.

The cases in which the spleen reached lowest down were, successively, cases 2, 17, 27, 38, 11, 36, 20, and 25.

The cases in which the upper pole of the left kidney was lowest down were, successively, cases 2, 29, 39, 7, 14, 27, and 28.

The cases in which the lowest point of the spleen was highest up in the abdomen were, successively, cases 37, 8, 4, 3, 10, 12, 18, and 21.

The cases in which the upper pole of the left kidney was highest up were, successively, cases 23 and 24, 21, 4, 34, 3, 16, 19, 12, and 36.

The figures in italics show the cases which were common to the two groups.

A consideration of these cases in the various tables and diagrams does not appear to establish any direct relationship—

apart from the general correspondence of visceral levels—between the level of the spleen and that of the left kidney.

Moreover, whilst a high position of the spleen seems specially associated with a highly-placed stomach, the reverse does not seem apparent.

In the case of a large spleen, the portion above the kidney and supra-renal body sometimes spreads down in front of those organs to the upper border of the pancreas, and thereby shuts the kidney and supra-renal out from any direct relationship with the stomach.

#### THE LEFT SUPRA-RENAL BODY.

The highest point of the left supra-renal body is situated in the average 5·5 cm. above E.F., at a distance of 4 cm. from the middle line, being overlapped for nearly a centimetre by the spleen. The innermost point, which is as a rule the inner extremity of the lower border, averaged 2·4 cm. from the middle line, the lower border being ·5 cm. above E.F. The left supra-renal body is a little higher and a little nearer to the middle line than the right.

The left supra-renal body is sometimes nearly lifted off the kidney in the cases in which the pancreas is much higher than the kidney, as in cases 17 and 31; and, on the contrary, it may be somewhat depressed in level under the opposite circumstances, as in cases 16, 24, 23, and 36.

#### THE LEFT KIDNEY.

The upper pole of the left kidney is situated in the average 4·5 cm. above E.F. in the lateral line (6·1 cm. from the middle line), or 1·1 cm. higher than the corresponding point of the right kidney. It projects in the average 1 cm. above the upper border of the pancreas. Traced downwards, its outer border reaches its most external point of 9·6 cm. from the middle line a little below the plane of E.F. (·6 cm.). Its lower pole is situated ·8 cm. higher than the corresponding pole of the right kidney, at 6·2 cm. below E.F. and 6·2 cm. from the middle line. The innermost point of its upper segment projects inwards

beneath the pancreas at 2·5 cm. above E.F. to 3·8 cm. from the middle line, and it is usually overlapped at this place by the supra-renal body for 1 cm.

Speaking roughly, the line E.F. passes transversely between the upper  $2/5$ " and the lower  $3/5$ " of the left kidney, and the lateral line passes vertically between its inner  $2/5$ " and its outer  $3/5$ ".

Its lower pole averaged 4·1 cm. above the umbilicus and 3·3 cm. above the highest point of the iliac crest, and was a little less than half-way between E.F. and C.D., whilst that of the right kidney was a little more.

*Variations.*—There were 24 cases, or 60 p.c., in which the upper pole varied between 3 cm. and 6 cm., inclusive, above E.F. There were 7 cases in which it was 2 cm. or less above E.F., the lowest being .5 cm. in cases 2 and 29. There were 8 cases more than 6 cm. above E.F., the highest being 8 cm. in cases 23 and 24.

The variations in the distance of its outer border from the middle line were not considerable. The average was 9·6 cm., and 32 cases were between 8·5 and 10·5 cm. inclusive.

It would not be expected that the left kidney, firmly imbedded as it is behind the other viscera at the upper part of the abdomen, would be exposed sufficiently to the pressure of the overlying viscera so as to alter its position along with them very directly, although a general correspondence in the visceral levels would be expected. We have seen that this is so with regard to the spleen, more particularly in an upward direction, and the same holds with regard to the stomach.

The kidney was lowest down in cases 2, 29, 39, 7, 14, 27, and 28, and highest up in cases 23, 24, 21, 4, 34, 3, 16, and 19. There seems to be no direct correspondence between the position of the lower border of the stomach and the upper pole of the kidney; for instance, in the last group of cases the stomach was very low down in Nos. 24 and 34, and was lower than usual in some of the other cases. In the first group the stomach was often low down, but not uniformly so.

In fact, as in the case of the right kidney, it seems that, whilst the connective tissues surrounding the left kidney remain firm, it is in a great measure independent of enlargements or displacements of the viscera in its neighbourhood.

*The two Kidneys.*—In 8 cases, or 20 p.c. (Nos. 5, 7, 10, 13, 17, 25, 29, and 31), the upper pole of the right kidney was higher than that of the left; in cases 5 and 10, being 3 cm. higher. In 3 cases the upper poles were on the same level, viz., in Nos. 2, 27, and 28. It is interesting to notice that three of the cases (Nos. 7, 2, and 27), in which the upper pole of the right kidney was high in relation to that of the left, were amongst those in which the distance between the upper pole of the right kidney and the upper border of the liver was least, and in which the question was asked whether the liver had simply passed downwards over the face of the right kidney, or had also, but to a less extent, pushed the kidney itself downwards. The fact that in these cases the upper pole of the right kidney was as high or higher than that of the left would considerably strengthen the conclusion already arrived at, that the liver, in these cases, had not displaced the right kidney downwards. On the contrary, these cases of relative high position of the right kidney, as compared with the left, only include two cases in which the distance between the upper border of the liver and the upper pole of the kidney was greater than the average (viz., cases 5 and 31).

The lower pole of the right kidney was higher than that of the left in 8 cases, or 20 p.c. again; (viz., in cases 4, 5, 7, 14, 16, 17, 25, and 40), and the extreme difference in these cases was 3 cm. in No. 16. The lower poles were on the same level in 5 cases; viz., Nos. 1, 10, 13, 29, and 33, so that in, roughly, 30 p.c. of the cases the right kidney was as high or higher than the left.

*The Iliac Crests.*—The average position of the lower pole of the right kidney was 2.5 cm. above highest part of the iliac crest, and that of the left 3.3 cm. There were 2 cases on the right side (Nos. 20 and 27), and none on the left, in which the lower pole of the kidney was lower than the iliac crest.

There were, further, 8 cases on the right side in which the lower pole of the kidney was down to the level of the iliac crest, or not more than 1 cm. above it; giving 10 cases, or 25 p.c., in which the lower pole of the right kidney was below, at the level of, or not more than 1 cm. higher than the highest part of the iliac crest.

On the left side there were 9 cases, or 22.5 p.c., in which the

lower pole of the kidney was on the level of, or not more than 1.5 cm. higher than, the highest part of the crest.

On the right side there were 4 cases, or 10 p.c., and on the left side there were 9 cases, or 25 p.c., in which the lower pole of the kidney was 5 cm. or more higher than the highest part of the iliac crest.

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### DESCRIPTION OF PLATES.

Plates XXXII., XXXIII., and XXXIV., on a scale representing centimetres, show the position of the parts of the large intestine, the vermiform appendix and the lines of the peritoneal attachments, in relation to the surface lines, the brim of the pelvis and other parts in the way that has been adopted throughout the other parts of the paper.

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### BIBLIOGRAPHY.

- (1) MACALISTER, *Text-Book of Anatomy*.
- (2) CUNNINGHAM, "Delimitation of the Regions of the Abdomen," *Jour. Anat. and Phys.*, 1893.
- (3) HIS, "Ueber Präparate zum Situs Viscerum," u.s.w., *Arch. f. Anat. u. Entwickl.*, 1873.
- (4) CUNNINGHAM, "Form of the Spleen and Kidneys," *Jour. Anat. and Phys.*, vol. xxix., 1894.
- (5) SYMINGTON, "On the Topographical Anatomy of the Pancreas," *Trans. Royal Med. Acad. Ireland*, vol. xiii., 1896.
- (6) BIRMINGHAM, "The Topographical Anatomy of the Spleen," etc., *Jour. Anat. and Phys.*, vol. xxxi., 1896.
- (7) WEINBERG, "Topographie der Mesenterien und der Windungen des Jejunum-ileum beim Neugeborenen Menschen," *Inter. Monatschr. f. Anat. u. Phys.*, p. 66 et seq., 1896.
- (8) SERNOFF, "Zur Kenntniss der Lage und Form des Mesenteriales Teiles des Dünndarmes und Seines Gekröses," *Inter. Monatschr. f. Anat. u. Phys.*, vol. xi., 1894.
- (9) WRIGHT, "The Sternum as an Index of Sex, Height, and Age," *Jour. Anat. and Phys.*, 1889-90.
- (10) SYMINGTON, *Quain's Anatomy*, vol. on Splanchnology.
- (11) SYMINGTON, "On certain Physiological Variations in the Shape and Position of the Liver," *Edin. Med. Jour.*, February 1888.
- (12) SYMINGTON, "A rare Abnormality of the Pancreas," *Jour. Anat. and Phys.*, 1884-5.
- (13) CUNNINGHAM, *Practical Anatomy*, vol. 1, p. 492.
- (14) LOCKWOOD, *Lectures on Hernia*, London, 1889.

(15) TREVES, *The Anatomy of the Intestinal Canal and the Peritoneum*, London, 1885.

(16) HENKE, "Der Raum des Bauchhöhle des Menschen," u.s.w., *His's Arch. f. Anat. u. Phys.*, 1891.

(17) LOCKWOOD and ROLLESTON, "On the Fossæ round the Cæcum," etc., *Jour. Anat. and Phys.*, 1891.

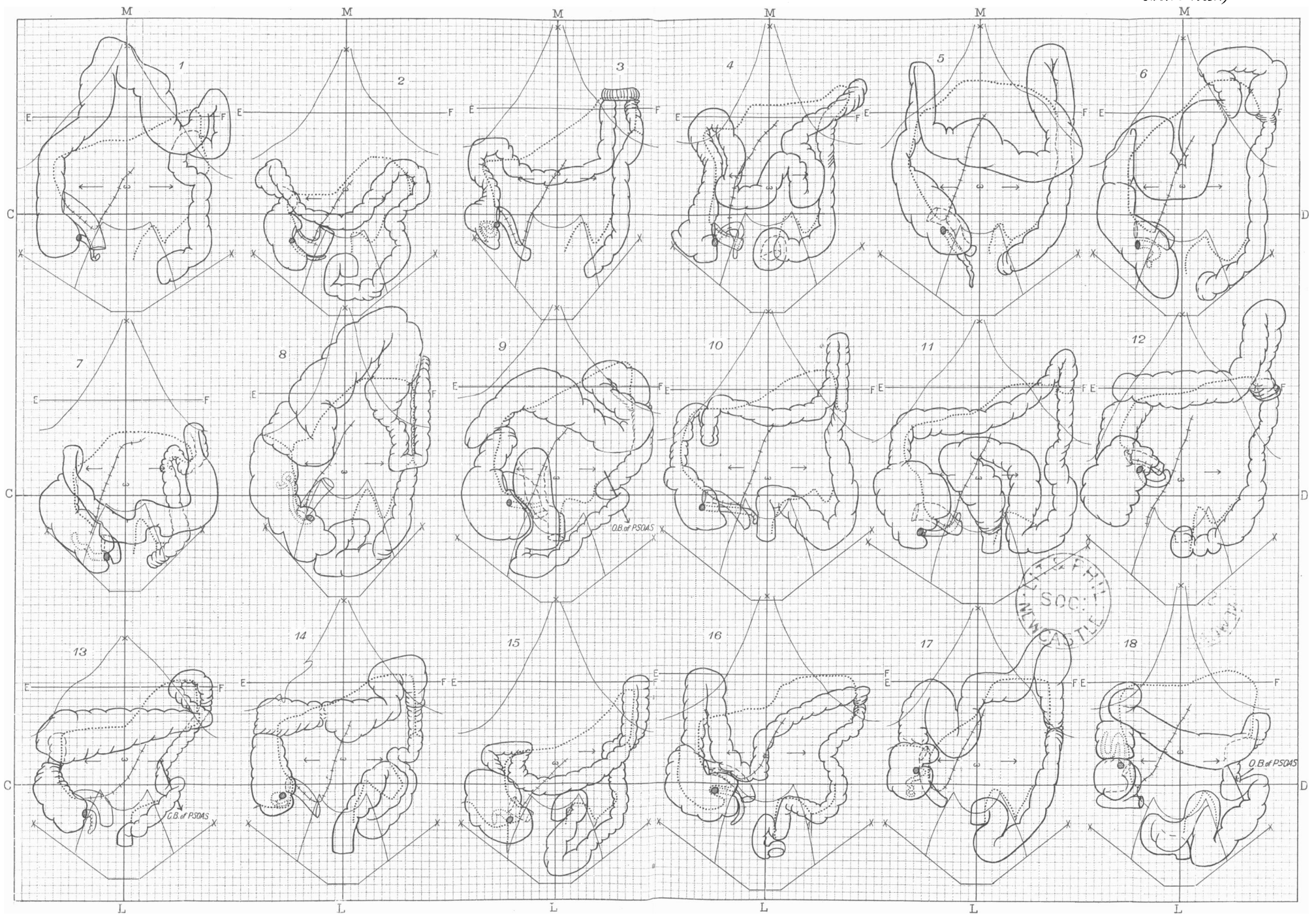
(18) BERRY, *The Cæcal Folds and Fossæ*, Edin., 1897.

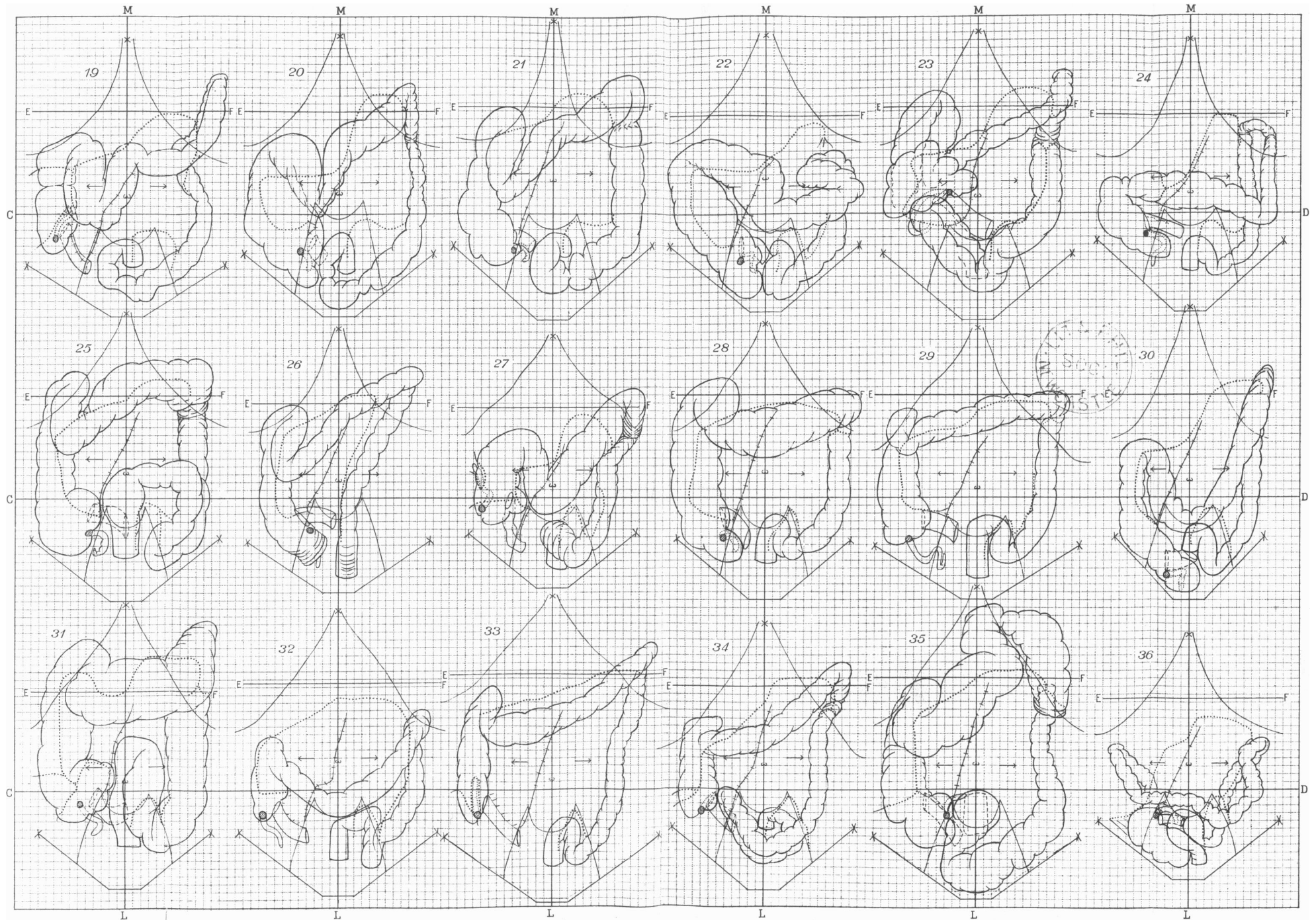
(19) MALL, "Development of the Human Intestine and its Position in the Adult," *Bulletin of the Johns Hopkins Hospital*, vol. ix. Nos. 90-91, Sept. to Oct. 1898.

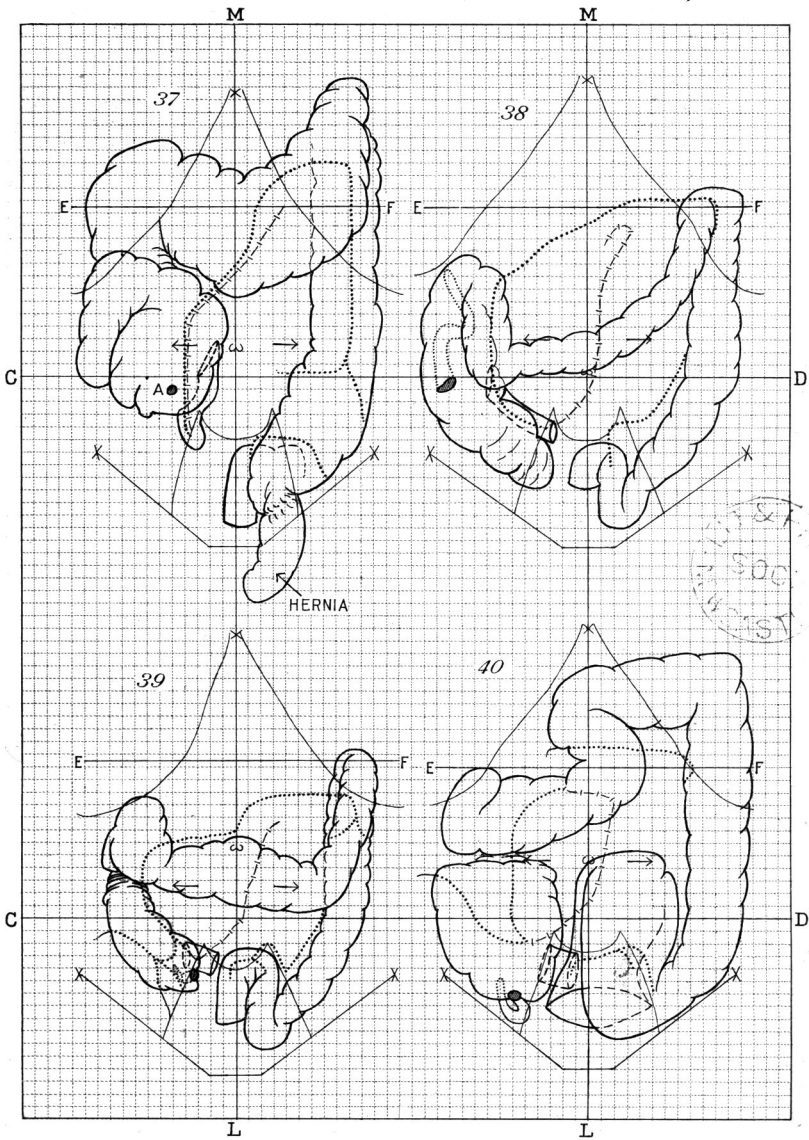
(20) JONNESCO, *Hernies Internes Rétro-péritoniales*, Paris, 1890.

(21) BYRON ROBINSON, "Peritoneal Supports," *Jour. Amer. Med. Assoc.*, Chicago, 1896.

(22) BYRON ROBINSON, "The Sigmoid Flexure," etc., *Matthew's Med. Quart.*, Louisville, vol. iii., 1893.







# PROFESSOR ADDISON ON ABDOMINAL VISCERA IN MAN.

APPENDIX.—TABLE V.—THE LARGE INTESTINE.

Number of Case,	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	AVERAGES, c.m. <sup>6</sup>
<i>The Cæcum, the lowest point as to the level of A.S. II. S., . . . .</i>	1b	2·5b	1·5b	2b	1b	6b	5b	5b	1b	·5a	1b	1a	1b	1a	3b	=	3a	3·5a	1·5a	4·5b	2·5b	6b	5a	2·25b	2·5b	3b	1a	3b	·5b	7b	1·5a	1·5a	1·5a	1a	1b	6b	3a	2b	1·5b	2·5b	1·23 below.
„ <i>distance of the lowest point from the middle line, . . . .</i>	9	6·5	8	7·5	3·5	3	4·5	5	6	7	8	8	7	8	6	7	8	8	9	4	6	1·5	10	4	6·5	4	8	4	10	=	5·5	9	10	9	6	1	5	4	4	5	6·1
„ <i>the innermost point as to the level of the A.S. II. S., . . . .</i>	2a	1b	=	·5b	1·5a	2b	1b	2b	1a	1·5a	·5a	*9a	2·7a	4a	=	3a	8a*	5·5a	4·5a	1a	·5b	4b	9·5a*	=	2a	=	4a	·5b	3·5a	4b LEFT 1·5	8a*	5·5a	3a	4·5a	2a	1·5b	10·5a*	=	1a	2·5a	2·1 above (2·07).
„ <i>distance of the innermost point from the middle line, . . . .</i>	6	5	7	6·5	·5	·5	1·5	1	3·5	5·5	3·5	3	4·5	6	3	3·5	5	5	6·5	2	4	=	=	2·5	3·5	1·5	3	3	5·5	1·5	1·5	6·5	8·5	6	3	=	·5	3	3	2	3·4 (3·36).
<i>Inner border of large intestine along C.D., „ „ (right) . . . .</i>	8·5	6	7·5	7	3	6	6	6	5·5	6·5	3·5	6·5	7·5	6	5	4	6	5	6·5	3	6	3·5	9	6	4	6	3	5·5	7	6	2	6·5	8	6	6·5	5	2	7	6	2	5·5
<i>Outer „ „ „ „ „ „ ( „ ) . . . .</i>	11·5	10·5	12	10	9·5	11	11	12	12	12	13	13	11·5	11·5	11·5	12·5	11	11	11·5	12	12	11·5	12	11·5	11·5	10	10	11·5	12·5	9	10·5	11	12	11	12	7	12·5	13	10·5	12	11·3
<sup>1</sup> <i>Highest point of the hepatic flexure of the colon as to E.F., . . . .</i>	1·5b	6·25b	4b	1a	6a	1·5b	6b	2b	2b	2b	3b	=	4b	2·5b	8b	=	=	·5b	4b	4b	1b	4b	1a	8·5b	2a	2b	5b	1a	2b	6·5b	6a	7b	2·5b	4·5b	1·5b	5·5b	3a	4b	4b	1b	2·5 below.
„ „ „ „ „ <i>from the middle line (farthest away), . . . .</i>	8	9·5	10·5	9	9	7	8	9	9	10	9·5	8	9·5	10	9	9·5	7	8	9	9	8	9·5	8	11	8	9	8·5	8	10	8	7	9	9	10	9	10	10	11	9	10	9 (8·98).
<sup>2</sup> <i>Lowest point of the hepatic loop of transverse colon as to E.F., . . . .</i>	×	×	×	12b	4·5b	9·5b	×	9b	×	7b	×	×	×	×	13b	14b	10b	5b	15b	13·5b	12b	×	10b	×	7b	10b	13·5b	6b	8b	×	4b	×	8·5b	8b	10b	13b	×	14·5b	9·5b	7b	9·8 below.
„ „ „ „ „ <i>the middle line, . . . .</i>	×	×	×	5	7	6	×	6	×	8·5	×	×	×	×	6	3	4	8	4	4	6	×	6	×	8	7	1	6	9	×	6	×	8	8	8	7	×	8	9	10	6·5
<i>Upper border of transverse colon in right lateral line as to E.F., . . . .</i>	·5b	11b	6b	·5a	6a	1b	11b	2a	=	1b	3b	2·5a	3b	2b	8b	=	=	=	3b	3b	=	3·5b	2a	7·5b	3a	·5b	3·5b	2a	3b	6b	6·5a	9·5b	2b	4b	·5b	11·5b	5a	11b	3·5b	1b	2·25 below.
„ „ „ <i>middle line as to E.F., . . . .</i>	9a	13b	8b	5b	1b	=	15·25b	8·5a	2a	2·5b	3b	2·5a	3b	2·5b	12·5b	7b	1a	6b	4b	2b	2b	5·5b	3b	7·5b	3·5a	=	7·5b	2b	=	14·5b	4a	14b	4b	5b	9a	12b	2·5a	10b	6·5b	7·5a	3·2 „
„ „ „ <i>left lateral line as to E.F., . . . .</i>	1b	6·5b	6b	=	5b	7·5a	13·5b	11a	3·5a	=	·5b	2·5a	3b	3a	10b	2·25b	4a	7b	5b	2a	2a	5·5b	1b	9·5b	4a	2a	1b	=	=	10b	5a	10b	=	=	8·5a	13·5b	6·5a	5b	8b	9a	1·3 „
<sup>3</sup> <i>Highest point of splenic loop of the transverse colon „ . . . .</i>	3·5a	6b	2·5a	5a	8·5a	8a	3b	4·5a	2a	7a	4·75a	12a	2a	3a	1a	1·5b	7a	4b	4·5a	3·5a	4a	4·5b	4·5a	1b	4·5a	4·5a	2a	·5a	·5a	3·5a	9a	3·5b	4a	3a	7·5a	5b	10·25a	1·5a	·5a	9a	2·9 above.
„ „ „ „ „ <i>the middle line, . . . .</i>	11·5	8	8·5	11·5	9	10	9	10·5	9	9	10·5	11	9	9	11	12	10	10	12	9	9·5	9	11	8	9	10	10	10	10	10	10	10	10·5	12·5	10	10	9·5	9·5	10	10	10 (9·95).
<i>Outer border of colon in E.F., as to the middle line (left of), . . . .</i>	13·5	...	10·5	9	12	12	...	11	12	10	11·75	12	11·5	10·5	12	...	11	...	12·5	10	11	...	12	...	11	9	11·5	12	11	10	11	...	12	11	12	...	11·5	12	11	13	10·6
<sup>5</sup> „ „ <i>(sigmoid) in C.D., as to the middle line, . . . .</i>	10·5	8	9	8·5	11	11	7	8·5	9	11·5	13	10·5	7·5	9·5	9	10·5	10	11	11	11	11·5	10	10·5	8·75	11	2·5+	8·5	11	10	9	10	11	9	8	11	9	11	12	10	12	9·5
<sup>4</sup> <i>Lowest point of the sigmoid flexure as to A.S. II. S., . . . .</i>	3·5b	3·5b	4b	1b	1·5b	4b	3·5b	4b	1a	2·5b	1·5b	2b	1a	2b	3b	=	2b	3·5b	2b	4·5b	4b	5·5b	=	3b	4b	...	2b	1·5b	2b	3·5b	1·5b	2b	2b	1b	3·5b	·5b	3b	2b	3b	4b	2·4 below.
„ „ „ <i>below C.D., . . . .</i>	8·5	8·5	7	5	6·5	9	8	8	4·5	7·3	7·5	7	4·25	7	8	5	7	9	8·5	9·5	8	9·5	5·5	6·5	9	...	6·5	7	8	8·5	7	7·5	8	6	10	4·5	9	8·5	7·5	8·5	7·4 „
„ „ „ <i>as to the middle line, . . . .</i>	6	5	5	6	5	6	5	6	4·5	7	7	6	5	5	6	7	6	6	6	5·5	5·5	5·5	6	6	5	...	5	5	5·5	5·5	6	6	5·5	6	6·5	6	4·5	5·5	5·5	5·5	5·6
<sup>7</sup> <i>Commencement of rectum below C.D., . . . .</i>	...	5	...	3	...	...	...	5	6	4	6	4	5·5	5	4·5	8	5	8	6	7	5	5·5	6	4	7	4·5	5	6	7	6	6	6	7	5	6	7·5	7	7	6	6	5·7 below.
<i>Band passing from the gall bladder to the hepatic flexure of the colon, . . . .</i>	...	...	..	...	+	...	...	+	...	...	...	...	...	...	...	...	...	...	+	...	+	+	+	+	+	...	+	+	...	...	...	+	+	...	...	...	...	...	...	...	

\* In cases marked thus, the innermost point of the cæcum was situated above the plane of C.D. ; the cæcum being bodily raised up.  
<sup>1</sup> The 'highest point' of the hepatic flexure of the colon really represents the highest point of the ascending colon as it bends forward ; not, necessarily, the highest point of the whole flexure—usually, in fact, it does not.  
<sup>2</sup> This is recorded on the loop downwards of the transverse colon, the point being taken at the lowest point of the convexity downwards, or midway along the lower border when the lower border is horizontal. The × indicates the absence of a hepatic loop downwards.  
<sup>3</sup> This is taken midway along the convexity upwards of the splenic loop of the transverse colon.  
<sup>4</sup> This is the lowest point reached before the intestine enters the pelvis—usually it is at the pelvic brim.  
<sup>5</sup> In case 26, in which there was a complete descending meso-colon, the outer border of the large intestine as it passed straight into the pelvis was counted as the outer border of the sigmoid flexure.  
<sup>6</sup> The averages given in some cases are approximate. In these cases the exact average is given in brackets.  
<sup>7</sup> Indicates that in these cases the point was not recorded.

# PROFESSOR ADDISON ON ABDOMINAL VISCERA IN MAN.

APPENDIX.—TABLE VI.—SOLID VISCERA.

	Number of Case,	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	Average. <sup>3</sup>
<sup>1</sup> The Liver.—The ‘left extremity’ from the middle line, . . . . .	...	6	5·5	11	7·75	7	6	4	5	3·5	7·5	6·5	8·5	5	11	12	6	10	12·5	7	5·5	10·5	5·5	11	7	7	8·5	2·5	2·5	7·5	5·5	4·5	7	13·5	·25	10	2·75	6	10·5	11	7·1	
“                “ above E.F., . . . . .	...	3·5	6	8	11·5	7	6	11	8·5	9·5	6	9	5	7	5	5·5	7	9	7	7·5	10	6	8·5	7·5	8	8	3	8	7	6·5	11·5	6	7	3	8·5	4·5	9	8·5	7·5	10	7·4	
The upper border in the middle line above E.F., . . . . .	...	5	9	13·5	13	9	8	11·5	8	10·5	6·5	10	8	8	6	8·5	8·5	11	9	9·5	11	7	8·5	9	10	6	8·5	7·5	8	12	7	9	10	9	7	10	9·5	10	10·5	11	9 above.	
“ lower         “ as to E.F., . . . . .	...	5·5 <sup>b</sup>	2 <sup>a</sup>	4·5 <sup>a</sup>	5 <sup>a</sup>	=	3·5 <sup>b</sup>	3 <sup>a</sup>	2·5 <sup>a</sup>	4·5 <sup>a</sup>	1·5 <sup>b</sup>	=	3 <sup>b</sup>	=	8 <sup>b</sup>	4·5 <sup>b</sup>	1·5 <sup>b</sup>	2 <sup>a</sup>	2 <sup>b</sup>	=	2 <sup>a</sup>	4 <sup>b</sup>	·5 <sup>b</sup>	=	2·5 <sup>a</sup>	1 <sup>a</sup>	3·5 <sup>b</sup>	5 <sup>a</sup>	2·5 <sup>a</sup>	2 <sup>b</sup>	5 <sup>a</sup>	2 <sup>a</sup>	3·5 <sup>b</sup>	2 <sup>b</sup>	...	5 <sup>b</sup>	7·5 <sup>a</sup>	·5 <sup>b</sup>	6 <sup>a</sup>	2 <sup>a</sup> (.17).		
“ upper         “ right lateral line above E.F., . . . . .	...	4·5	9·5	14	14	8·5	5·5	11	13·5	13·5	7·75	12	9·5	11	4	9	12	11	9·5	11·5	12·5	9	13	9·5	12	11·5	7	11	9·5	9·5	13	8	9	12·5	11	8	11·25	12·5	10·5	14	10·4 above (10·38).	
“ lower         “ “ as to “ . . . . .	...	6 <sup>b</sup>	4 <sup>b</sup>	1·5 <sup>a</sup>	6 <sup>a</sup>	1·5 <sup>b</sup>	9·5 <sup>b</sup>	=	=	=	3 <sup>b</sup>	·5 <sup>b</sup>	4·5 <sup>b</sup>	=	13 <sup>b</sup>	6 <sup>b</sup>	4·5 <sup>b</sup>	=	5 <sup>b</sup>	4 <sup>b</sup>	2 <sup>b</sup>	6 <sup>b</sup>	2 <sup>a</sup>	8 <sup>b</sup>	=	=	6 <sup>b</sup>	2 <sup>a</sup>	3 <sup>b</sup>	4·5 <sup>b</sup>	3 <sup>a</sup>	2 <sup>b</sup>	3 <sup>b</sup>	4·5 <sup>b</sup>	2 <sup>b</sup>	8 <sup>b</sup>	6 <sup>a</sup>	1·5 <sup>b</sup>	6 <sup>b</sup>	2·5 <sup>a</sup>	2·4 below.	
“ ‘lowest point’ below E.F., . . . . .	...	9	7	1	4 <sup>a</sup>	8	12	5·5	8	7	10	9·5	8	7	13	9·5	7·5	8	5·5	9·5	5·5	6	7·5	8·5	6·5	6·5	9	5	8·5	9	2	10	7	7·5	8	11	4·5	8	7	6	(7·38).	
“                “ from the middle line, . . . . .	...	11·5	12	10	10	10·5	10·5	11	12·5	13	12·5	12·5	11	12	11	12	11·5	10·75	12	12	10·5	11	12	10·5	12	10·5	11·5	12	13	10·5	10·5	11·5	12·5	12	12	11	12	13	11	12·5	11·5	“
“ right border in E.F., from the middle line, . . . . .	...	11·5	12·5	10	...	10·5	10	10	12·5	14	12	12	12	12	9·5	11	12	10·75	10	10·5	10·5	10	12	11	12·5	11	11·5	12	13·5	11	10·5	11	13·5	12	12	10	12·5	14·5	11	11·4	“	
<sup>2</sup> The Left Kidney.—The upper pole above E.F., . . . . .	3·5	·5	7	7·5	3·5	5·5	2	4·5	3	5	2·5	6	4	2	4	6·5	3	5	6·5	4	7·75	4·25	8	8	5·5	3·5	2	2	·5	5	3·5	4·5	4·5	7·5	5	6	4·5	5·5	1·5	5·5	4·5 above.	
“                “ from the middle line, . . . . .	6·5	6	6	6·5	6	5·5	5	5·5	7	7	6	7·5	5·5	6	7	7	7·5	5·5	6·5	6	5·5	6	5	6·5	6	5·5	6	6·5	5	6	6·5	7	6	6	5·5	6·5	6·5	6	6	6·1	6·1 above.	
“ ‘internal point’ (superior) from the middle line, . . . . .	4	3	4	4·25	4	3·5	3	3·25	4·25	4·25	4·5	3	3	4	4·5	3·5	3·5	3·5	3	3·25	3·5	3·5	3	4	3·75	3·5	4	4	3	4·25	4·25	4·5	4	4·5	3	5	4	3·75	3·8	3·8		
“ ‘outer point’ . . . . .	9·5	8·5	10	9	9·75	9	7·75	8·75	11	11	10·5	12	9·25	10	11	10·5	11·25	9·25	11	9·5	9	9·5	7·5	9	9·25	9·5	9	10	10	9·5	9·5	10	9	9	8	10	10·5	9·25	9·6	9·6		
“                “ as to E.F., . . . . .	1 <sup>b</sup>	4 <sup>b</sup>	=	3 <sup>a</sup>	1 <sup>b</sup>	=	3 <sup>b</sup>	1 <sup>b</sup>	2·5 <sup>b</sup>	=	2 <sup>b</sup>	=	2 <sup>b</sup>	3 <sup>b</sup>	2 <sup>b</sup>	=	2 <sup>b</sup>	=	1 <sup>a</sup>	2 <sup>b</sup>	4 <sup>a</sup>	=	2 <sup>a</sup>	3 <sup>a</sup>	2 <sup>a</sup>	=	3 <sup>b</sup>	3 <sup>b</sup>	4 <sup>b</sup>	=	2 <sup>b</sup>	=	=	2 <sup>a</sup>	=	1 <sup>b</sup>	=	3 <sup>b</sup>	=	·6 below.		
“ lower pole below “ . . . . .	7	9·5	4·5	2·5	5·25	4	7	6·5	7	4	7·5	4·5	6	9	8·5	6	8	6·5	5·5	7·5	2·25	8	3·5	3·25	5	7	8	7	9	6·5	8	7	4	7	4·5	6	6·25	9	6·5	6·2	“	
“                “ from the middle line, . . . . .	6·5	6·5	7	5	7	6	5·5	6	8	7	7	8	6	6·5	5	6·5	8	6	6·5	6	4·5	6	6	5	6	6·5	5	5·5	6·5	5	6·5	6·5	7	6	6·5	5·5	6·5	6·5	6	6·2	“	
The Right Kidney.—The upper pole above E.F., . . . . .	3	·5	3·25	6·75	6·5	4·25	2·5	2	2	8	1·5	3·5	4·5	·5	1·5	6	5	2	4	=	5	2	3	5·5	6·5	3	2	2	1	3	4	·5	4	7	4·5	5·5	3	2	·25	5	3·4 above.	
“                “ from the middle line, . . . . .	6·5	6	6·5	6·5	6	6	5	3·5	6	7	7	5·5	5	6	5	6·5	5	5	4	5·5	4	4·5	5·5	5	6	5	6	6	6·5	6	6	6	6	6	6·5	5·5	6	6·5	5·5	5·6		
“ ‘internal point’ (superior) from the middle line, . . . . .	5	3·5	4	4	4	3	2·5	3	4·5	4·75	5·5	3·5	2·5	5	3	4	3	3·5	3	4·5	2·75	2·75	4	3·5	4	4	3·25	4·25	5	4	4·5	5	3·5	4·5	5	4	4	4	3·9	3·9		
“ ‘outer point’ . . . . .	10·5	10·25	11	10	9·5	9·75	7	7·5	10	12·5	12	10·5	10	10·5	10·25	11	9·5	10	9	10	8	10	10	8·25	10·5	10	9·5	10	11	9	9·25	9·75	10	8·5	9·5	8·5	10	12	10	9·8		
“                “ as to E.F., . . . . .	=	5 <sup>b</sup>	2 <sup>b</sup>	3 <sup>a</sup>	1 <sup>a</sup>	=	=	5 <sup>b</sup>	3 <sup>b</sup>	=	5 <sup>b</sup>	3 <sup>b</sup>	=	4 <sup>b</sup>	4·5 <sup>b</sup>	=	=	2 <sup>b</sup>	3 <sup>b</sup>	=	4·5 <sup>b</sup>	2 <sup>b</sup>	=	=	3 <sup>b</sup>	4 <sup>b</sup>	3 <sup>b</sup>	2 <sup>b</sup>	1 <sup>b</sup>	5 <sup>b</sup>	2 <sup>b</sup>	=	1 <sup>b</sup>	=	4 <sup>b</sup>	=	5 <sup>b</sup>	=	2 below (1·97).			
“ lower pole below “ . . . . .	7	11	8	1	2	6	6	8·5	8	4	8	7	6	8	9	3	6	9	7·5	10·5	4·25	9	8	5·5	4	8	8·5	7·5	9	7	7	9	5	7·5	6	6·5	10·25	10	5·5	7	“	
“                “ from the middle line, . . . . .	7	6·5	6·5	5·5	7	6·5	5	5	7	8·5	9	7·5	7	8	6·5	7	6·5	6	6	7	5·5	6·5	6·5	5·5	6·5	6	6	6·5	7·5	6·5	6	8	7	5·5	6·5	6	6·5	8	6·6	“		
The Left Supra-Renal.—The highest point above E.F., . . . . .	4·25	...	5·5	9	7	7·25	3	5·5	5·5	7	4	7	4·75	4	4	5·5	5	5·5	6	6	8·25	6	8·25	7·5	6	5·5	2	4	2	5·25	7	5	5·5	8	5·5	5·75	5	5·5	3	6·5	5·5 above.	
“ lowest “ as to “ . . . . .	1·5 <sup>b</sup>	...	1 <sup>a</sup>	3·75 <sup>a</sup>	1·5 <sup>a</sup>	3 <sup>a</sup>	1·5 <sup>b</sup>	1 <sup>a</sup>	=	2 <sup>a</sup>	1 <sup>b</sup>	1·5 <sup>a</sup>	·5 <sup>b</sup>	1 <sup>b</sup>	·5 <sup>b</sup>	=	1 <sup>a</sup>	1 <sup>a</sup>	=	2·5 <sup>a</sup>	·75 <sup>a</sup>	3 <sup>a</sup>	1·75 <sup>a</sup>	2 <sup>a</sup>	·5 <sup>a</sup>	3 <sup>b</sup>	1·5 <sup>b</sup>	3 <sup>b</sup>	·5 <sup>a</sup>	1 <sup>b</sup>	·5 <sup>a</sup>	3 <sup>a</sup>	1·5 <sup>a</sup>	1 <sup>a</sup>	=	2·5 <sup>b</sup>	1 <sup>a</sup>	·5	“			
“ innermost point from the middle line, . . . . .	2	...	2	2	2·5	2·5	2	2	4	3·25	3	3	2	2·5	2·75	2·25	2	2·25	2·5	1·5	2·25	2·5	2·5	1·75	1·5	2·25	2·5	2·5	2·5	2	2·75	2·5	2·5	2·5	3	2	3·25	2·5	2·5	2·4		
The Right Supra-Renal.—The highest point above E.F., . . . . .	4·25	3	4	7·75	8·5	7	3·75	5	4	8·75	4	5	5	4·75	3·5	7	5·5	4·5	6·25	3·5	6·5	4	5	7·5	7·75	5	4	3	3	4·5	6·5	4·5	6	8·5	6	6	4·75	4·5	3·25	6·75	5·3 above.	
“ lowest “ as to “ . . . . .	·5 <sup>b</sup>	2·5 <sup>b</sup>	1·5 <sup>b</sup>	3·5 <sup>a</sup>	3·5 <sup>a</sup>	1·5 <sup>a</sup>	1 <sup>b</sup>	=	=	4·25 <sup>a</sup>	1·5 <sup>b</sup>	=	·5 <sup>b</sup>	·5 <sup>b</sup>	1·5 <sup>b</sup>	2·75 <sup>a</sup>	1 <sup>a</sup>	=	1 <sup>a</sup>	1·5 <sup>b</sup>	1 <sup>a</sup>	2	2·25	2·25	2·25	=	2 <sup>b</sup>	2 <sup>b</sup>	2 <sup>b</sup>	1 <sup>b</sup>	·5 <sup>b</sup>	·5 <sup>a</sup>	3 <sup>a</sup>	1·5 <sup>a</sup>	6	·5 <sup>b</sup>	1·25 <sup>b</sup>	2·5 <sup>b</sup>	·2	“		
“ innermost point from the middle line, . . . . .	3·5	2·25	2·5	3	3	2·75	1·5	2	3·25	3·5	4	1·5	2	2·5	1	3	2·25	1·5	2	3·25	2	2	2·75	2	2	2	2·75	2·5	2	2·75	2·5	3	2·5	3	1·5	3	2·5	2·5	2·5	2·5	2·5	
The Inferior Vena Cava.—The outer border over the right supra-renal from the middle line, . . . . .	5·5	3	3·5	3·75	4·5	3·75	3·25	3·5	3·75	4·75	5	2·75	3·75	3	2·5	4·5	4·25	3·5	3	3·75	2·75	3·5	4	3	3·5	3·5	2·5	3·5	3·5	3·5	3	3·5	3·25	3	3·5	3·5	3·5	4	3·5	4	3·6 (3·57).	

<sup>1</sup> *The Liver* by the 'left extremity' is nearest the spot nearest to the plane of E.F. at which the liver reaches its extreme left.

The 'lowest point' is taken on the lowest part of the liver as far as possible to the right of the middle line.

<sup>2</sup> *The Kidneys*.—The 'internal point' is the innermost point of the upper segment of the kidney.

The 'outer point' is the spot on the outer border of the kidney nearest to the plane of E.F. at which the kidney reaches its extreme right or left (as the case may be).

<sup>3</sup> *Average.*—The averages given in some cases are approximate. In these cases the exact average is given in brackets.